Service Oriented Architecture

SOA

California Enterprise Architecture Program

January 10, 2006

Introduction

SOA Introduction

- A Paradigm shift for California
  "Stove pipe" applications to Federated Components
- Re-thinking and re-shaping the way State government interacts with its customers
- "Make government services more accessible to citizens and state clients" -- *California Strategic Technology Plan Goal 1*
- Requires new Governance & Funding models, Development, Operations, and changes to the Project Approval Process
- SOA – The big picture of what you can do with Web Services

What is SOA

- Open, web-based architecture
- Platform & language independent
- XML message based
- Highly interoperable
- Location transparency
- Many security features
- Wide vendor support
- Direct support for business services
- More than Web Services

California SOA Goals

- Provide the blueprint for a service oriented architecture that supports California business services and incorporates IAP (Identity, Access, Privacy) concepts
- Provide a key set of SOA principles.
- Ensure SOA fits into the California Enterprise Architecture model.
- Establish a California SOA Center of Excellence to provide SOA leadership, governance, and management of SOA components.

California SOA Principles

1. Design for ease of use
2. Design web services with appropriate granularity
3. Reassemble before Rewrite
4. Design loosely coupled web services
5. Web services must have well defined interfaces
6. Design stateless base web services

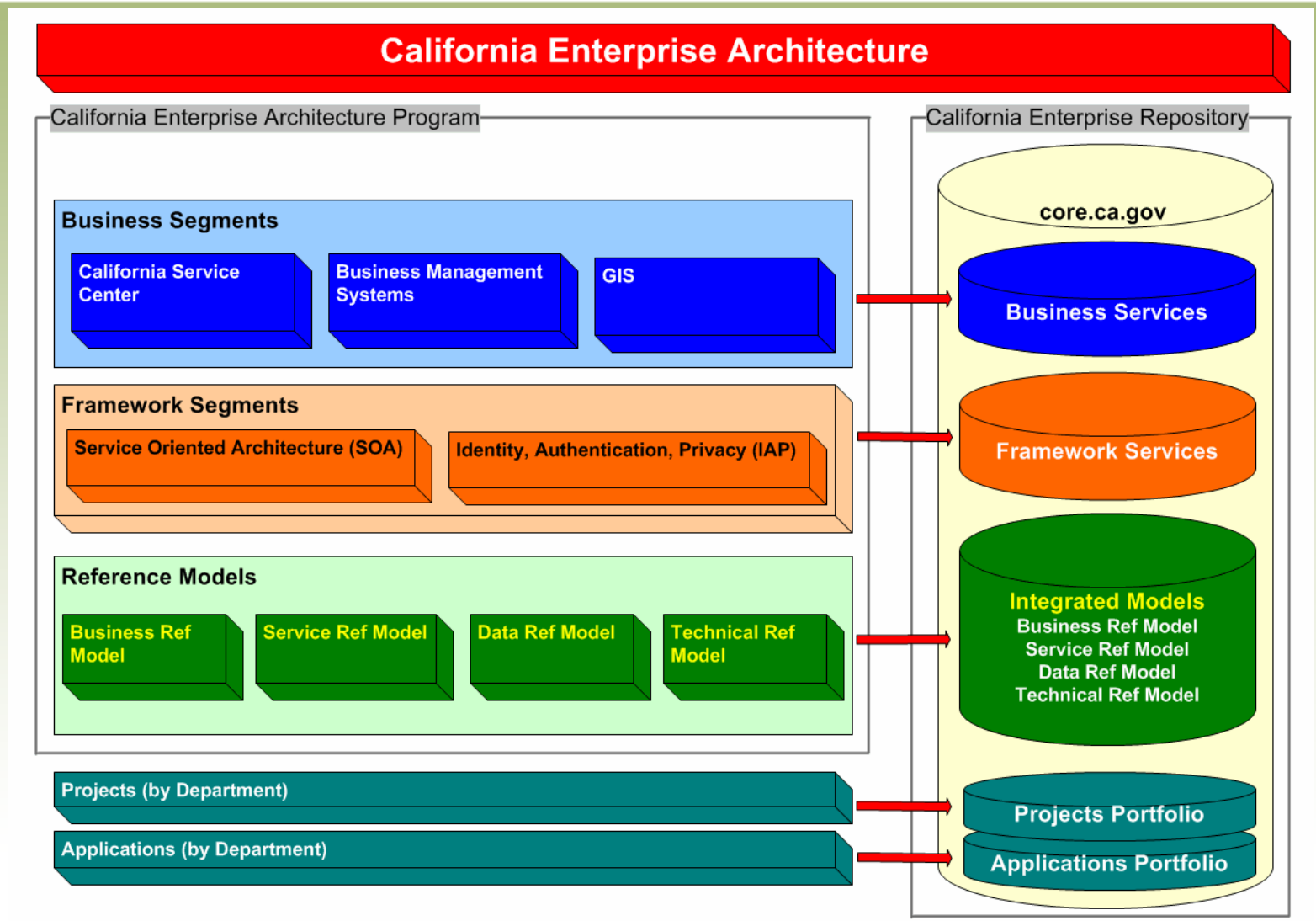
   (doesn't require knowledge of actions taken by a different web service)

California SOA Principles

7. Implement business processes via orchestrating web services
8. Governance & funding structures must be created to manage web service development, deployment and operational environments
9. Implement web services security and policy enforcement standards
10. Provide for transaction failures

    (design services so all transaction items either succeed or rollback)

CA Enterprise Architecture Model



BRM and SRM Example

	Business Reference Model				Service Reference Model			
Customer Audience	**Business Service Group**	**Line Of Business**	**Business Function**	**Business Service**	**Service Domains**	**Service Types**	**Service Components**	**WS Type**
C2G	Regulatory & Compliance	Licensing	Professional Licensing	Medical Doctor License	Business Management Services	Payment Services	Credit Card Payment Service	Base
						Customer Services	Address Verification Service	Base
					Authorization Services	Professional License Qualifying Services	Check Criminal Background Service	Base
							Check License Qualifications Service	Base
							Check Qualifications Fulfillment Service	Base
C2G	Financial Assistance	Title IV Grants	Post-Secondary Education	Cal-Grant	Business Management Services	Payment Services	EFT Payment Service	Base
					Grants Service	Grant Eligibility Services	Student Financial Eligibility Service	Base
							Student Academic Eligibility Service	Base
B2G	Revenue Collection	Business Tax Payments	Employer Income Taxes	Personal Income Tax	Business Management	Payment Services	Business Payment Service	Composite
				State Disability Tax	Reporting Services	Employer Reporting Services	Base Wage Reporting Service	Base
B2G	Regulatory & Compliance	Licensing	Permits	Encroachment Permit	Business Management Services	Payment Services	EFT Payment Service	Base
							Credit Card Payment Service	Base
					Electronic Delivery Services	Issuance Services	Issue Permit Service	Base
						Confirmation Services	Email Confirmation Service	Base
E2G	Government Services Management	HR Management	Organization & Position	Position Control	Employee Services	Position Tracking	Personnel Transaction	Base
				Employee History		Emp Pos Track		
			Compensation Management	Salary & Leave		Comp Tracking		
				Time & Attendence		Attend Tracking		

Governance

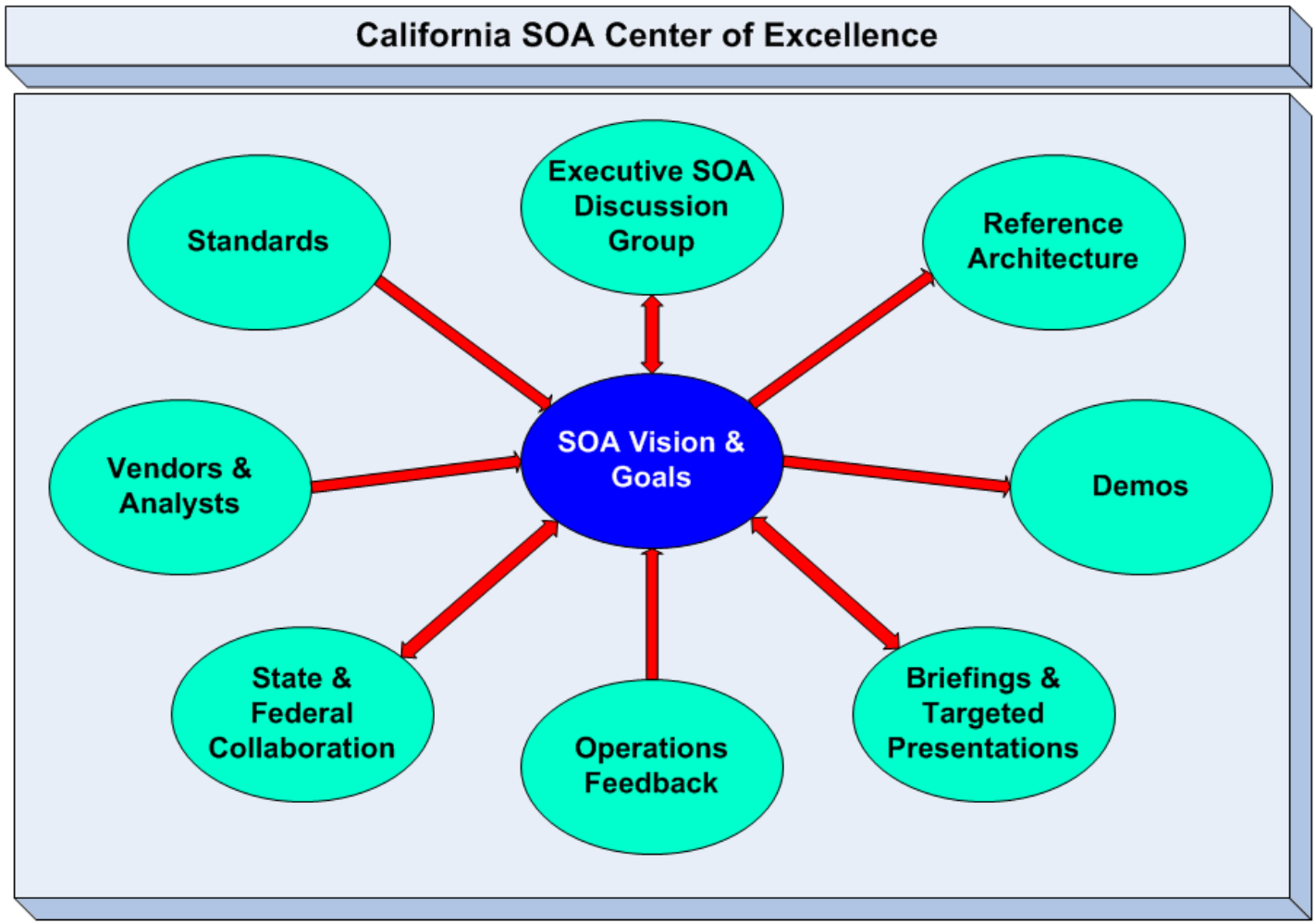
Enterprise Issues

- How will shared services be governed?
- How will shared services be funded?
- How will shared service components be mapped to business services?
- How will component versioning and release packaging be controlled?
- How will components be certified?
- How will component usage be inventoried and tracked?
- How will enterprise troubleshooting be handled?
- How will developers be supported?

Enterprise Issues

- How will components be tested for performance, availability, scalability
- How will developers locate code for an existing service?
- How will enterprise components be promoted and marketed?
- Will there be a centralized SOA help desk?
- How will business and technical architects determine which components already exist?
- Will there be demo applications?
- Will there be a state-wide search service using a common language?

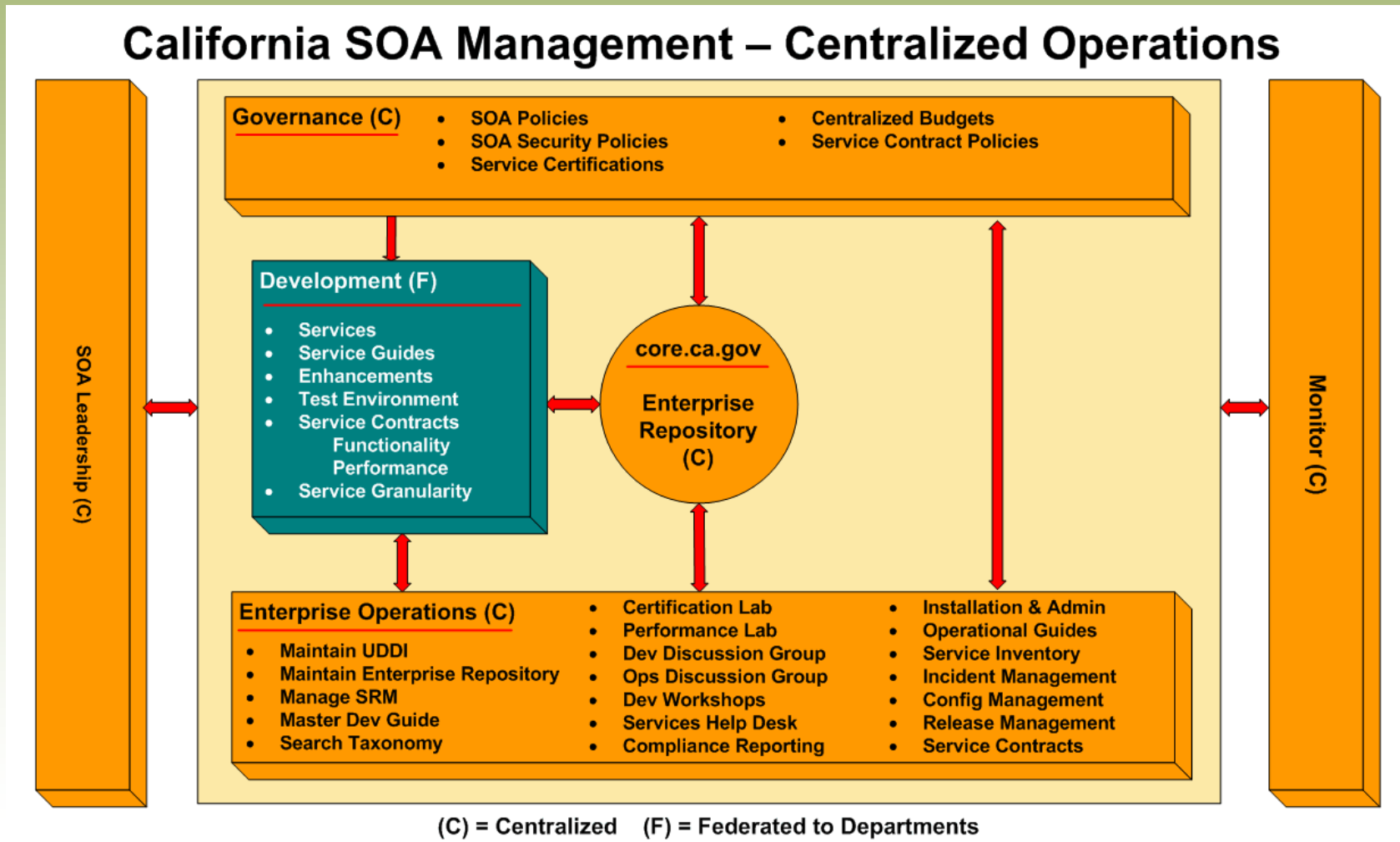
SOA Excellence Model



Centralized vs Federated

- A successful state-wide SOA program will require both centralized and federated components
- Singular vision & goals, governance, enterprise repository management, and many operational functions should be **centralized**
- Service development should be **federated** to the producing departments.

Centralized Operations Model



Architecture

Web Services

- A service in SOA is an application function packaged as a **reusable** component for use in a business process.
- Web Services stress **interoperability** and **location transparency**. (XML/HTTP/SOAP/WSDL/UDDI)
- Web Services are **language agnostic** and **platform independent**. (XML interfaces)
- Web Services use web based messaging:
  - SOAP/HTTP (WSDL)
  - HTTP-GET (REST)
  - HTTP-POST
- Web Services directly support Business Services
  - Service Reference Model ⇨Business Reference Model

Web Service Types

- Base Web Service (fine-grained)
  - Stateless, encapsulated information
  - Examples: Address Verification, Credit Card Payment, Check Academic Qualifications
- Composite Web Service (course grained)
  - Stateful, orchestration of base services
  - Implement complex business processes
  - Usually implemented in BPEL (industry standard for web services process flow)
  - Examples: Payment, Professional License, Business Permit
- REST (HTTP-Get)
  - Everything in the URL (no SOAP or WSDL)
  - http://api.local.yahoo.com/LocalSearchService/V1/localSearch?appid=YahooDemo&query=pizza&zip=95661&results=2
    - Returns first two pizza places found in Roseville, CA

SOAP (XML Document)

- Simple Object Access Protocol
- A simple XML based protocol to let applications exchange information over HTTP
- SOAP is a protocol for accessing a Web Service

WSDL (XML Document)



- Web Service Definition Language
  - Interface
    - Web Methods (service actions)
  - Service
    - Name, Description, Namespace
    - Location (service URL)
  - WSDL can be placed in a UDDI repository
    - Public directory of available services
  - Interface Only vs Deployment documents

Standards - General

- Organizations
  - W3C
  - OASIS
- SOAP, XML, WSDL, UDDI
- WSIL (Web Services Inspection Language)
  - May replace UDDI
- WSRP (Web Services for Remote Portlets)
  - Descriptive GUI
- WS-Reliability, WS-ReliableMessaging

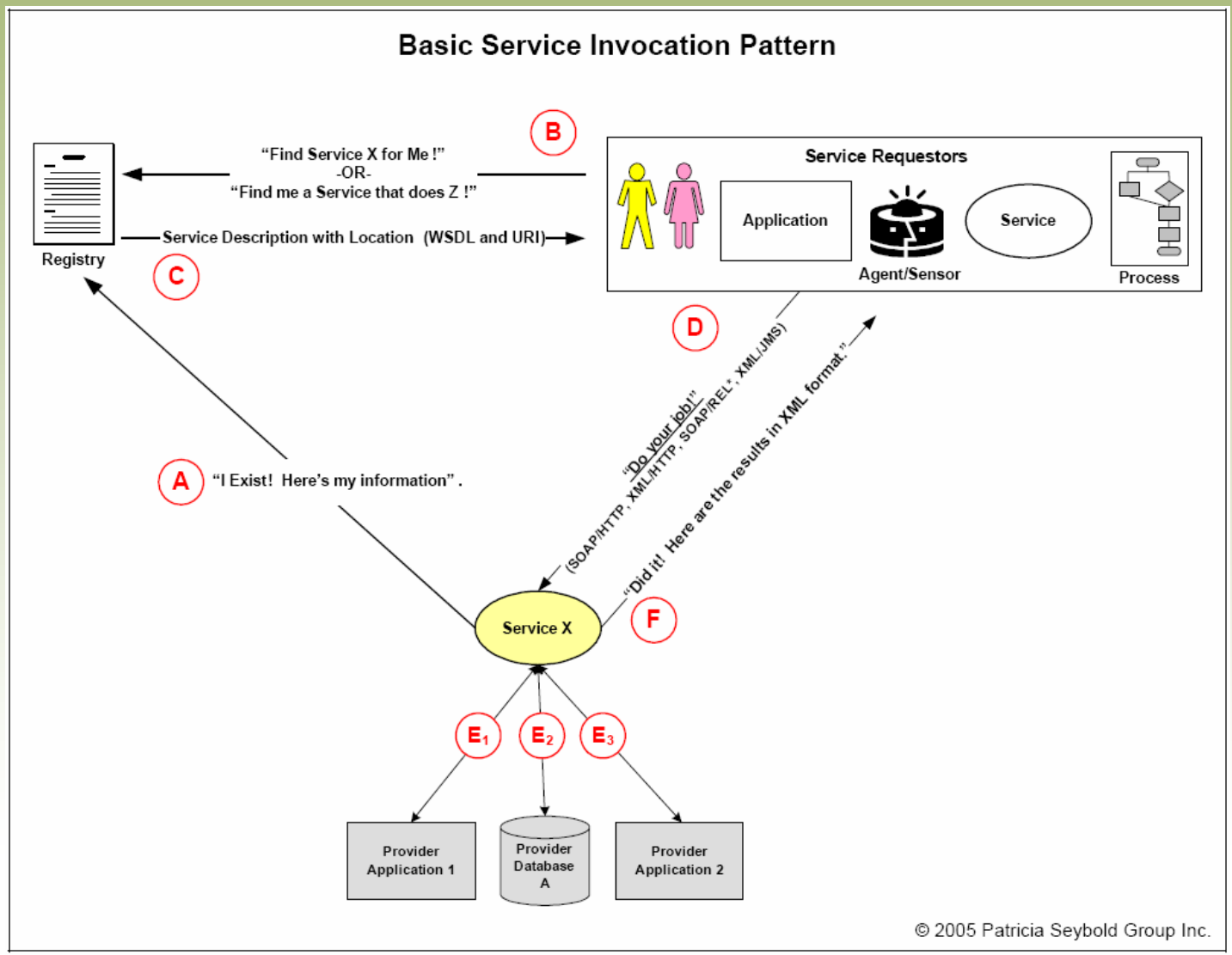
Standards - Process

- BPEL (Business Process Execution Language)
  - OASIS - IBM, Microsoft, BEA
- WSCL (Web Services Conversation Language)
  - HP
- WSCI (Web Services Choreography Interface)
  - BEA, Sun, SAP
- BPML (Business Process Markup Language)
  - W3C
- BPSS (Business Process Specifications Schema)
  - ebXML
- WSFL (Web Services Flow Language)
  - IBM
- XLANG
  - Microsoft

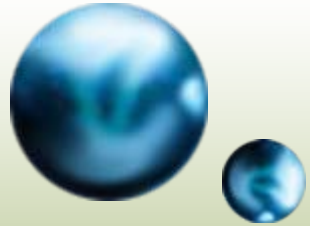
Standards - Transaction

- WS-Transaction
- WS-Coordination
  - Atomic
  - Business Activity (long running)

A Basic WS Example



Reference Enterprise Architecture

- Set architecture direction
- Browser-based applications
- Web services based
- Common components
  - Business rules engine
  - Enterprise services
  - Shared services
  - Directory services
- Three platforms
  - .NET
  - J2EE
  - Mainframe
- Integration via Enterprise Service Bus

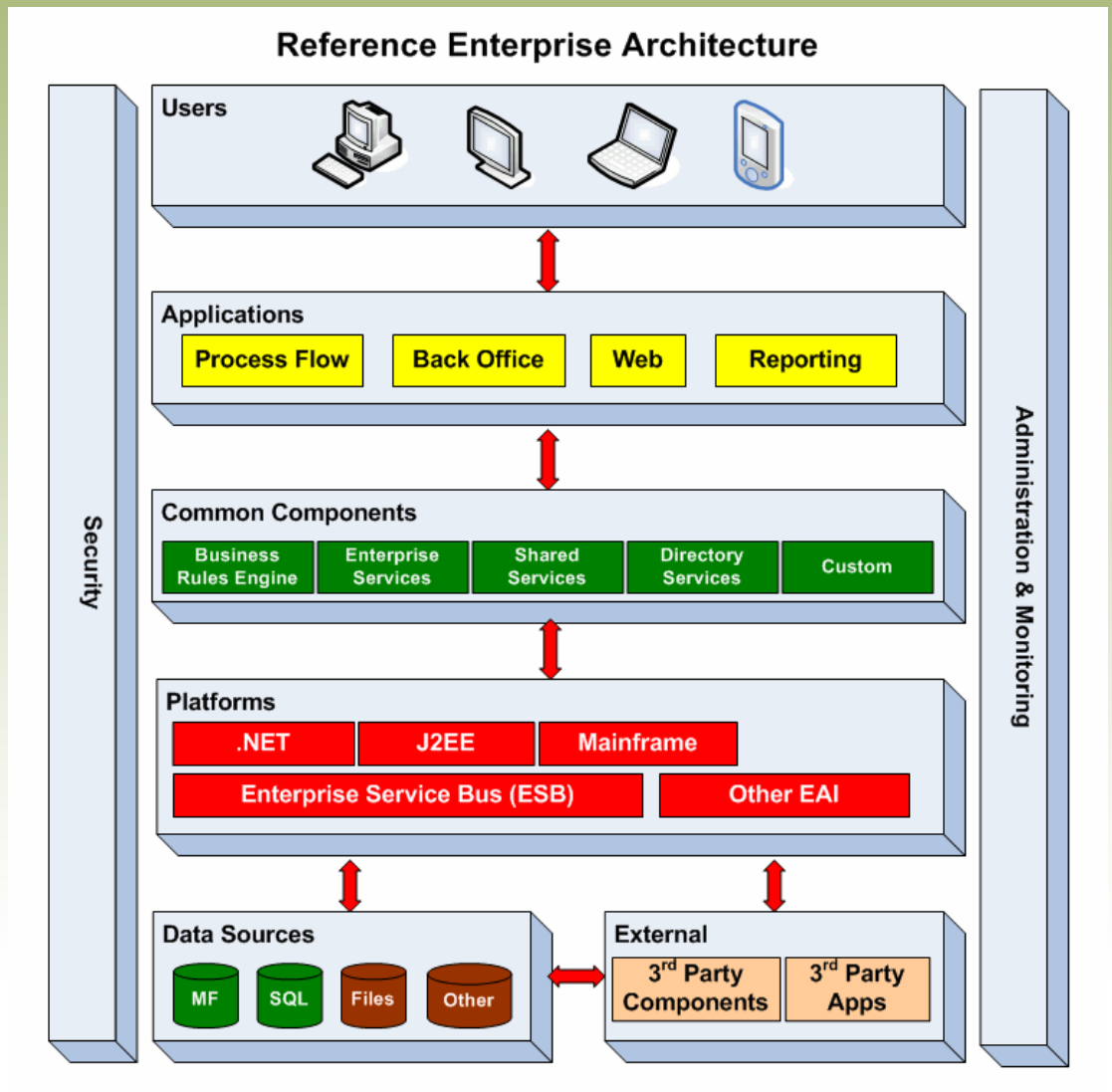
Ref Arch – Enterprise Services

- State-wide scope
- Recommended mandatory usage
- May be COTS/Packaged Application
  - HR, Admin, Financial, Asset Management
  - Enterprise Search
  - RSS (Subscription/Alerts/FAQs/News)

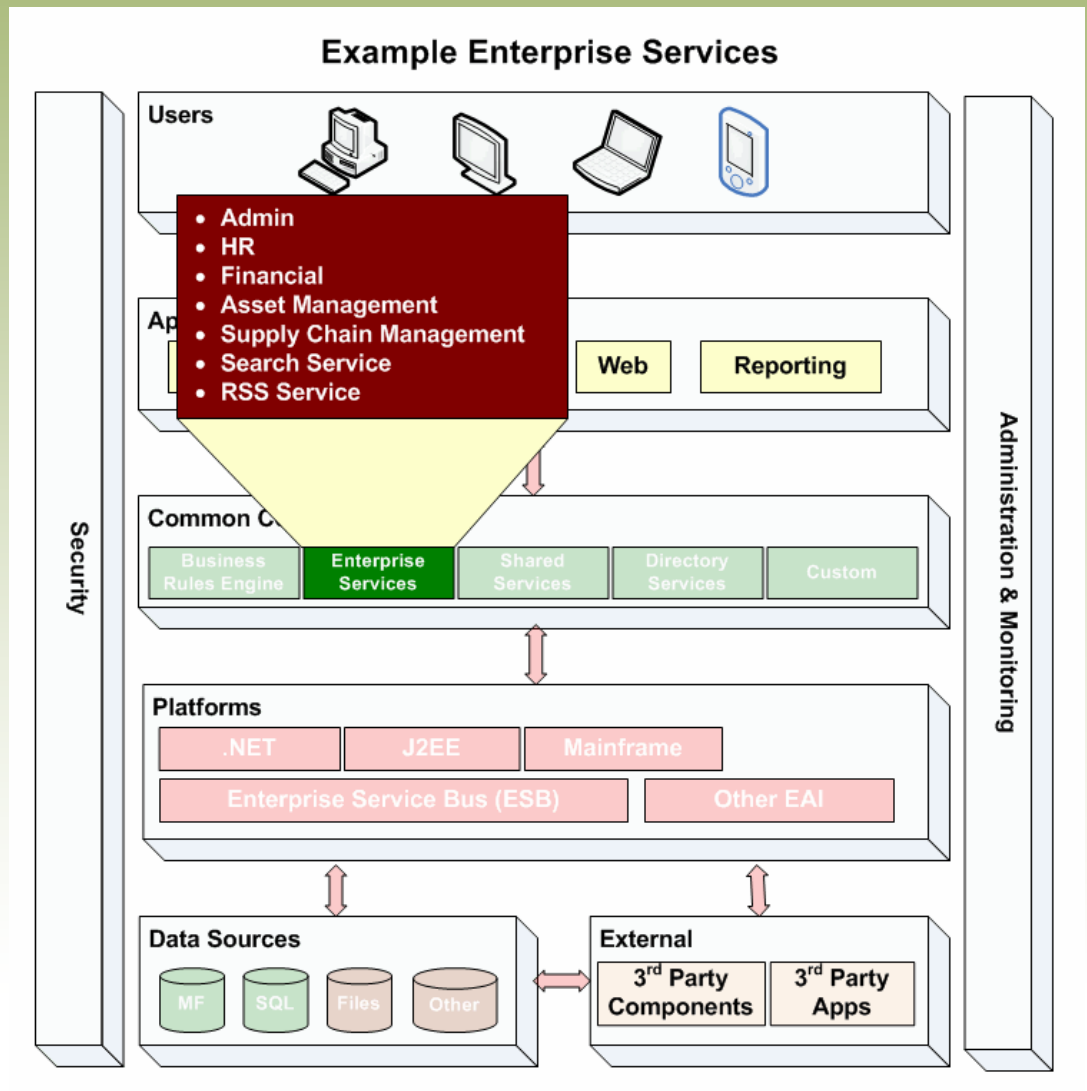
Ref Arch – Shared Services

- Community of Interest scope
- Consumed by applications
- Shared services – single development org
  - Address Verification Service
- Shared services – multiple dev organizations
  - GIS Web Services
- Composite Shared Services
  - Payment Service

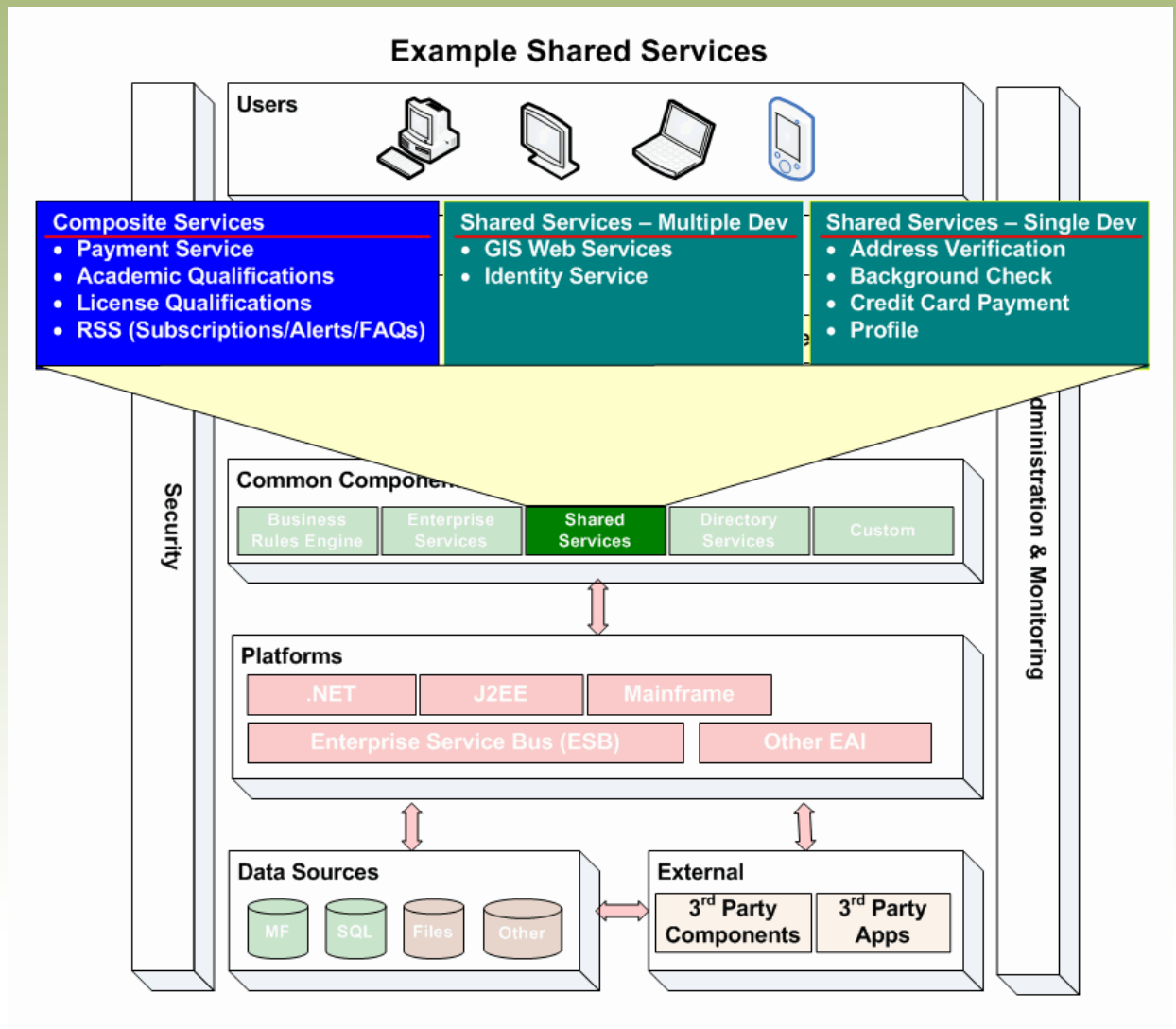
Reference Architecture



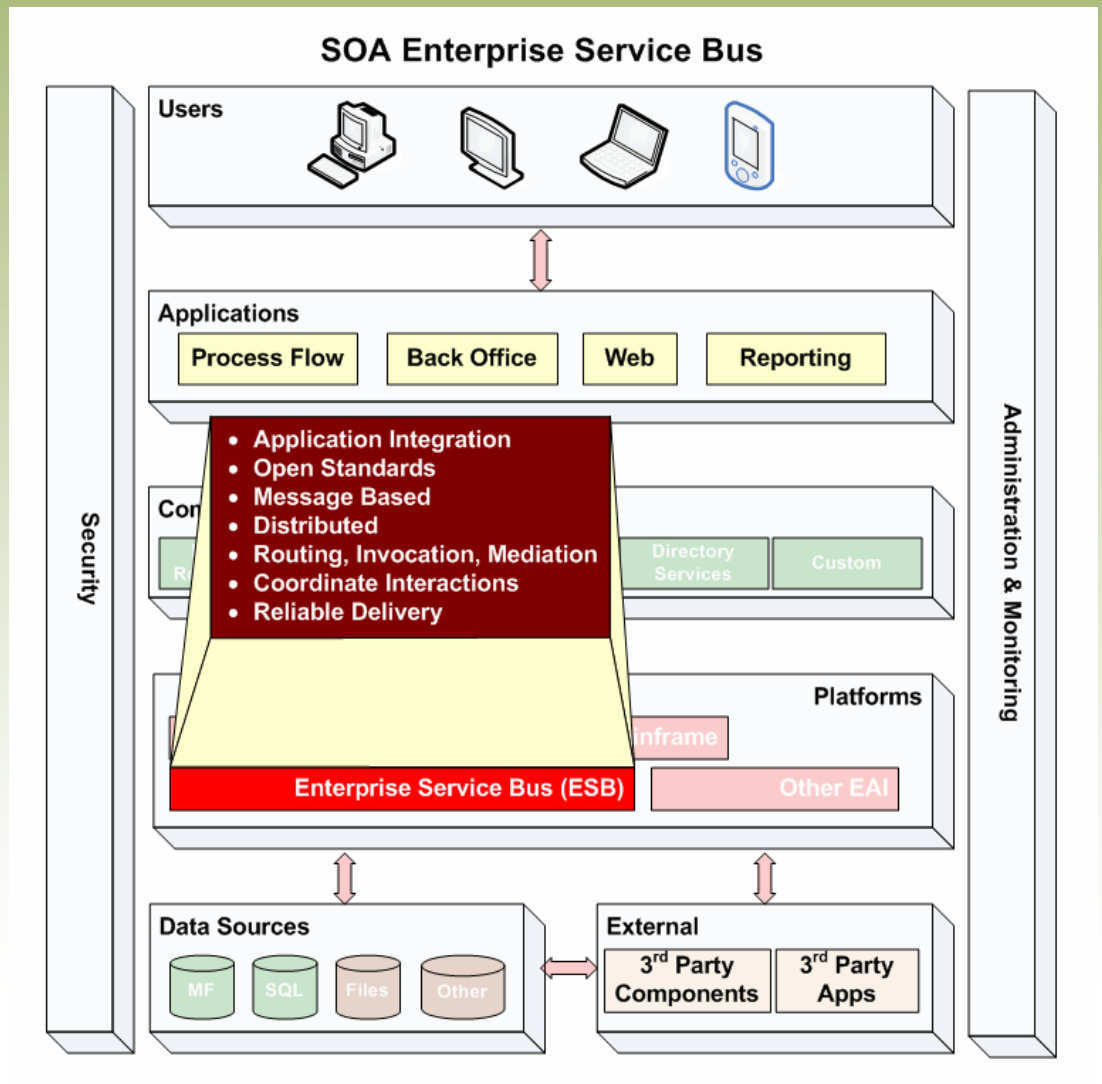
Ref Arch - Enterprise Services



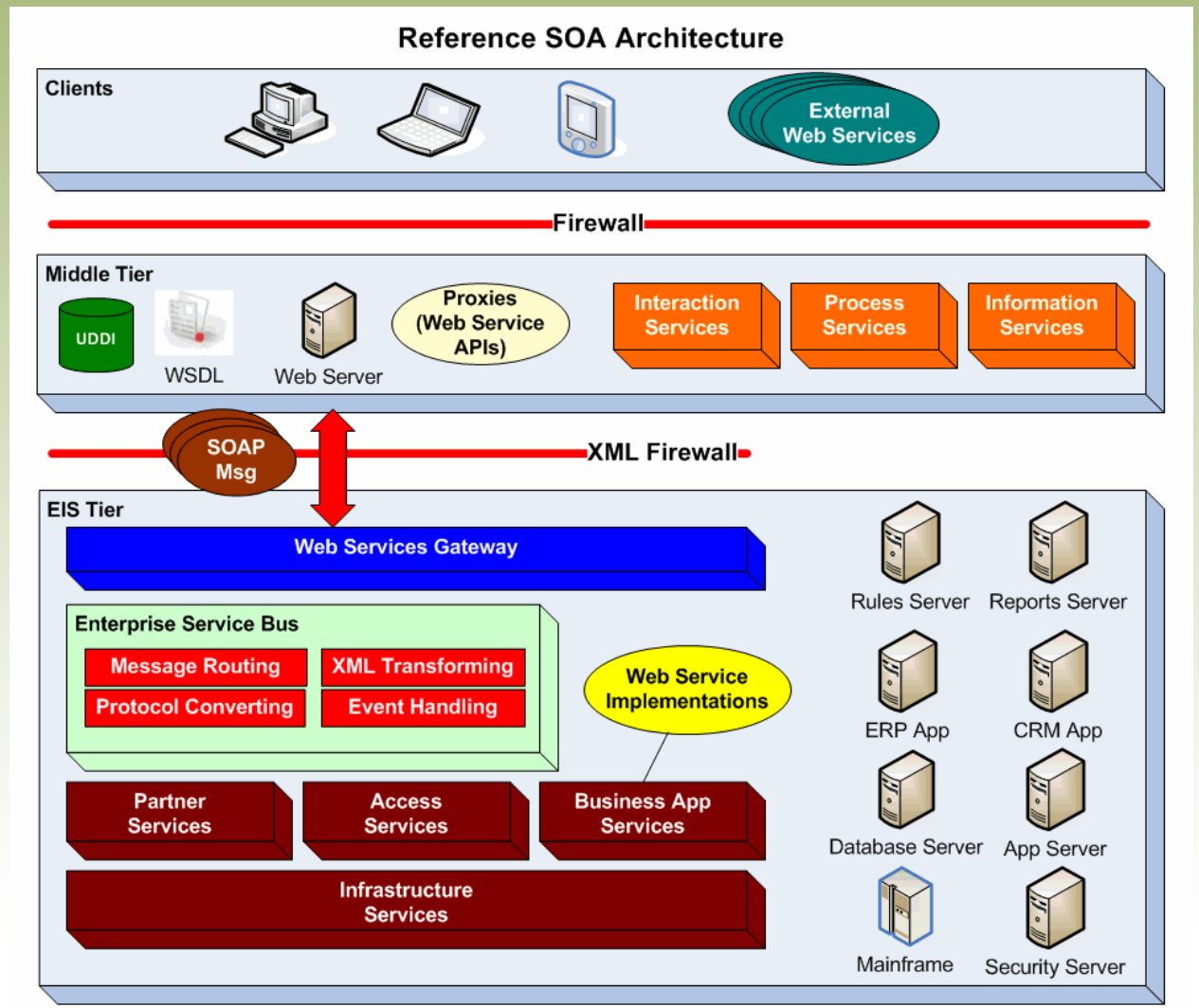
Ref Arch - Shared Services



Ref Arch - ESB


SOA Enterprise Service Bus
Users
Applications
Process Flow
Back Office
Web
Reporting
Application Integration
Open Standards
Message Based
Distributed
Routing, Invocation, Mediation
Coordinate Interactions
Reliable Delivery
Directory Services
Custom
Platforms
Enterprise Service Bus (ESB)
Other EAI
Security
Administration & Monitoring
Data Sources
MF
SQL
Files
Other
External
3rd Party Components
3rd Party Apps

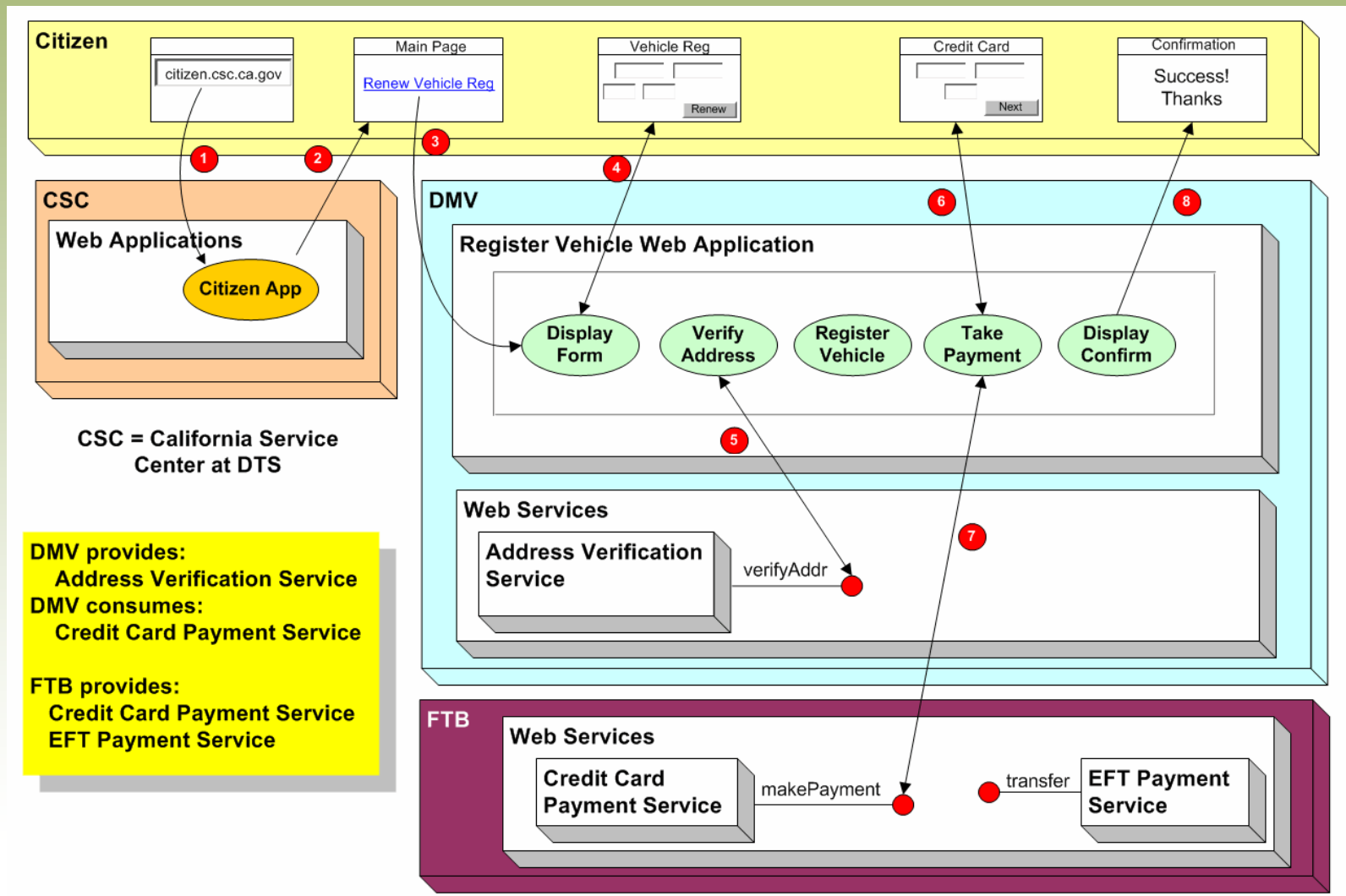
Reference Architecture



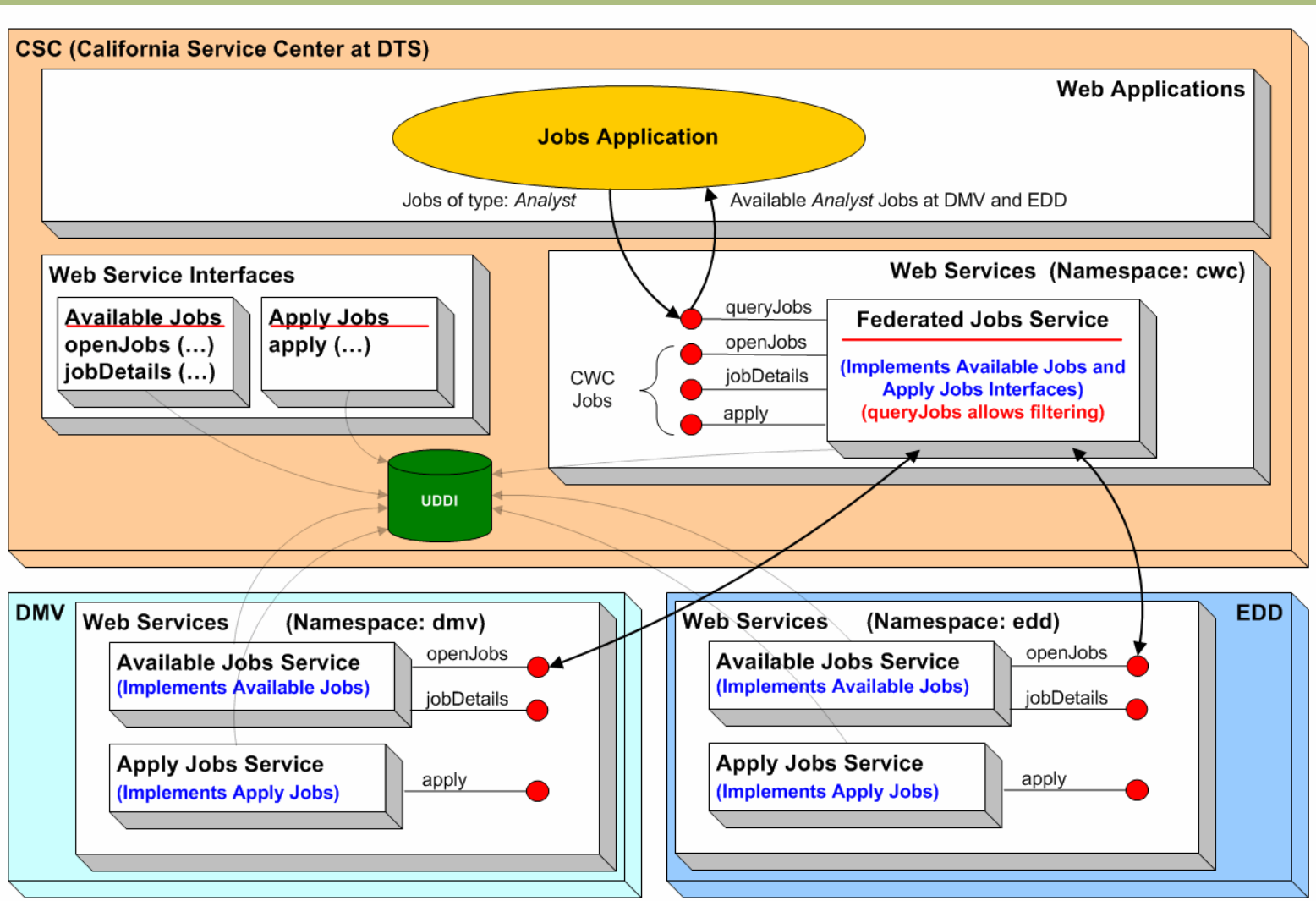
Web Service Models

- Application Consuming Web Services
- Composite Web Services
  - Business process orchestration
- Enterprise Search Services (Federated)
- Subscriptions/Alerts/News/FAQs Services
  - Real Simple Syndication

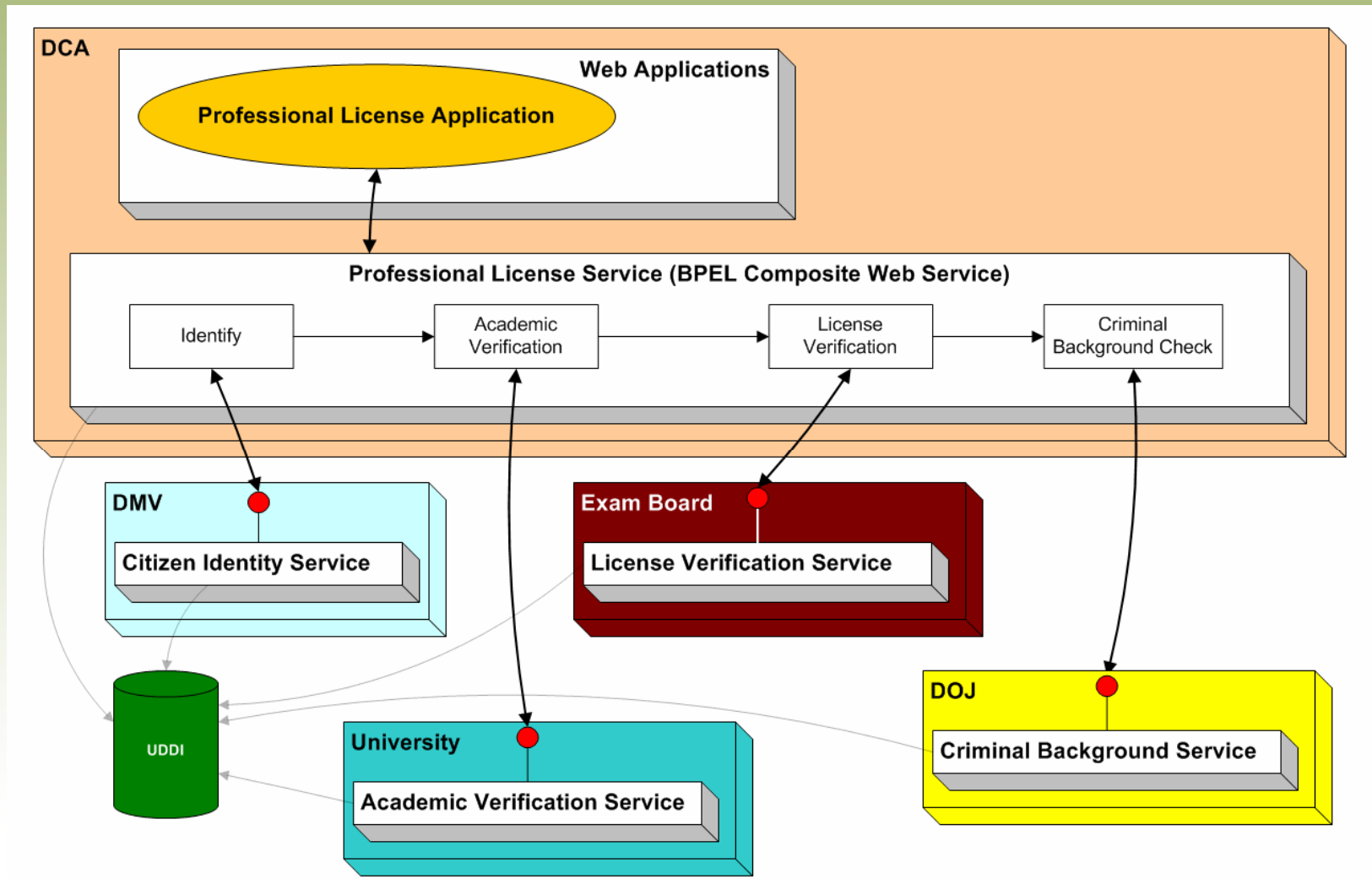
Web App Consuming WS



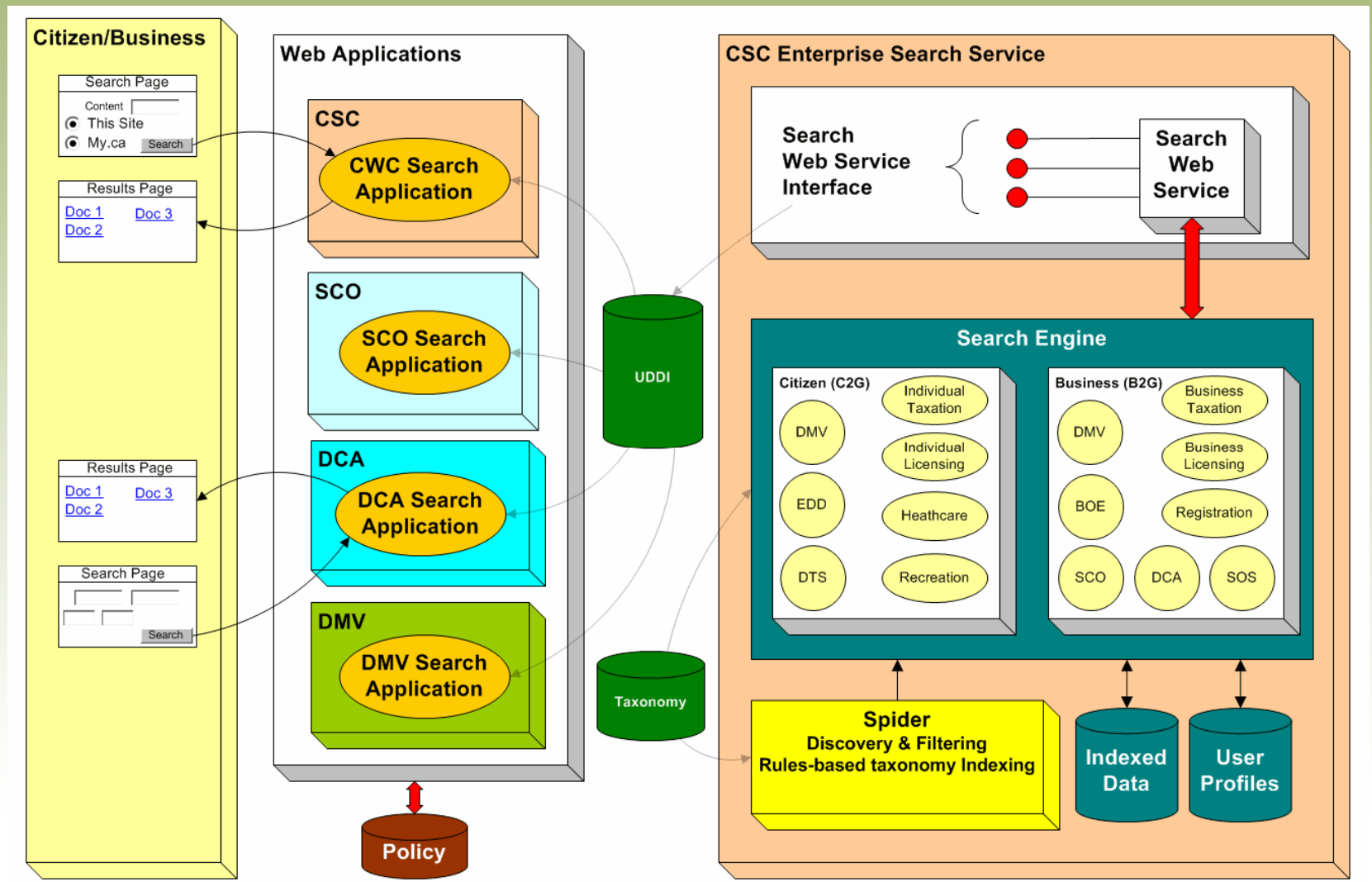
Federated Web Service



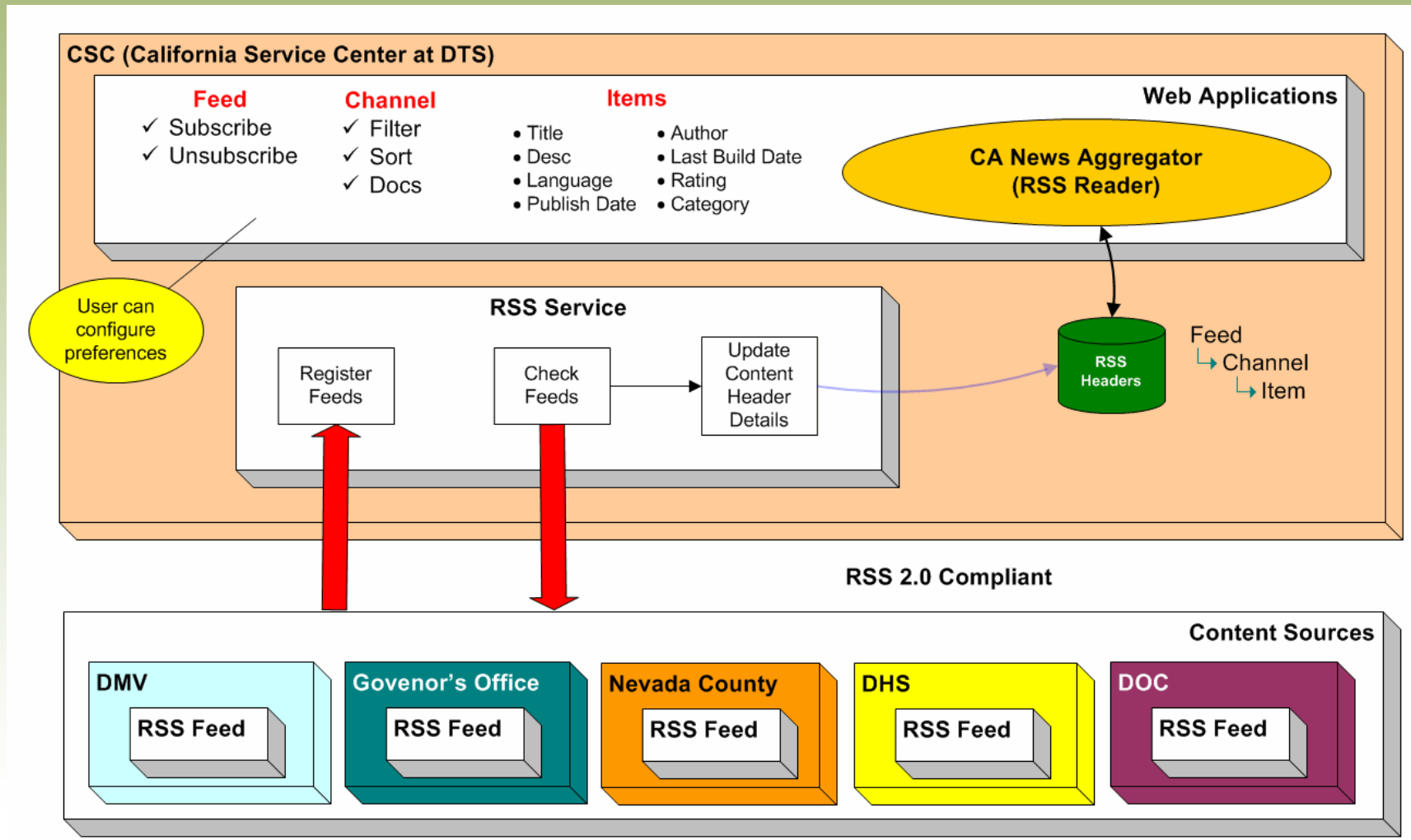
Composite Web Service



Enterprise Search Service



Subscriptions/Alerts/News/FAQs



Web Services Security

Standards - Security

- WS-Security
  - Top level web services security management
- WS-Trust
  - Framework for security tokens
- WS-Provisioning
  - Federate identity management
- WS-Federation
  - Broker trust relationships in federated environment
- WS-Addressing
  - Specify Identification and addressing information
- WS-Authorization
  - Manage authorization data and policies
- WS-Policy
- WS-Privacy
- SAML (Security Assertion Markup Language)
- STS (Secure Token Service)

SOA Security

- Organizations
  - W3C, IETF, OASIS
- XML Security for Web Services (W3C)
  - XML Signatures (XMLDS)
    - Defines the processing rules and syntax to wrap message integrity, message authentication, and user authentication data inside an XML format.
  - XML Encryption
    - Encrypted data is wrapped inside XML tags
- WS-Security (OASIS)
  - Defines the mechanism for including integrity, confidentiality, and single message authentication features within a SOAP message
  - Uses XML Signatures and XML Encryption

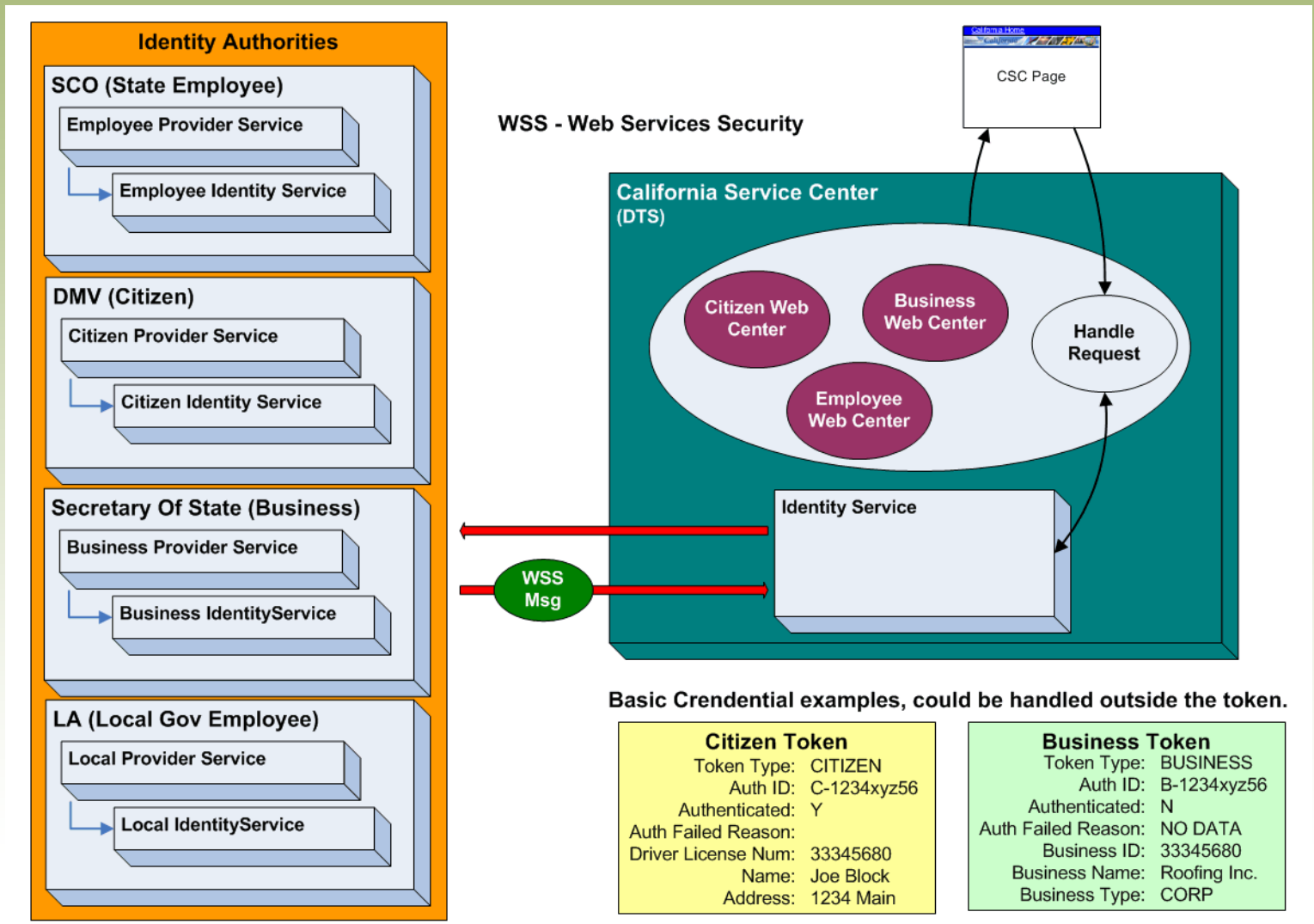
SOA Security

- SAML – Security Assertion Markup Language
  - Standard protocol for sharing security information
- XACML (eXtensible Access Control Markup Language
  - Defines a vocabulary to specify subjects, rights, objects, and conditions
- Digital Signatures
  - Keys used to produce and verify digital signatures

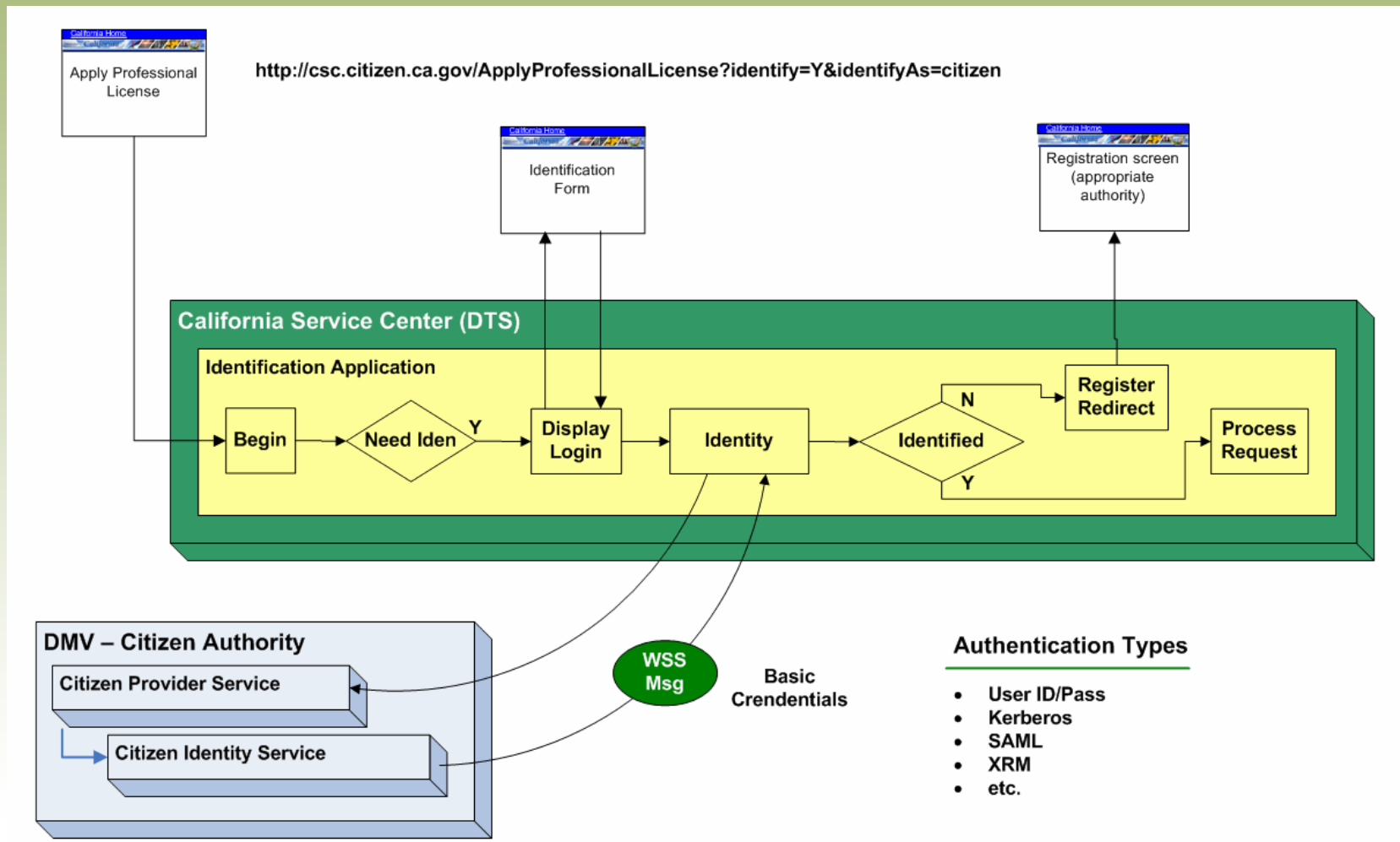
SOA Security

- Certificates
  - A data structure that holds the identification and public key of the certificate owner

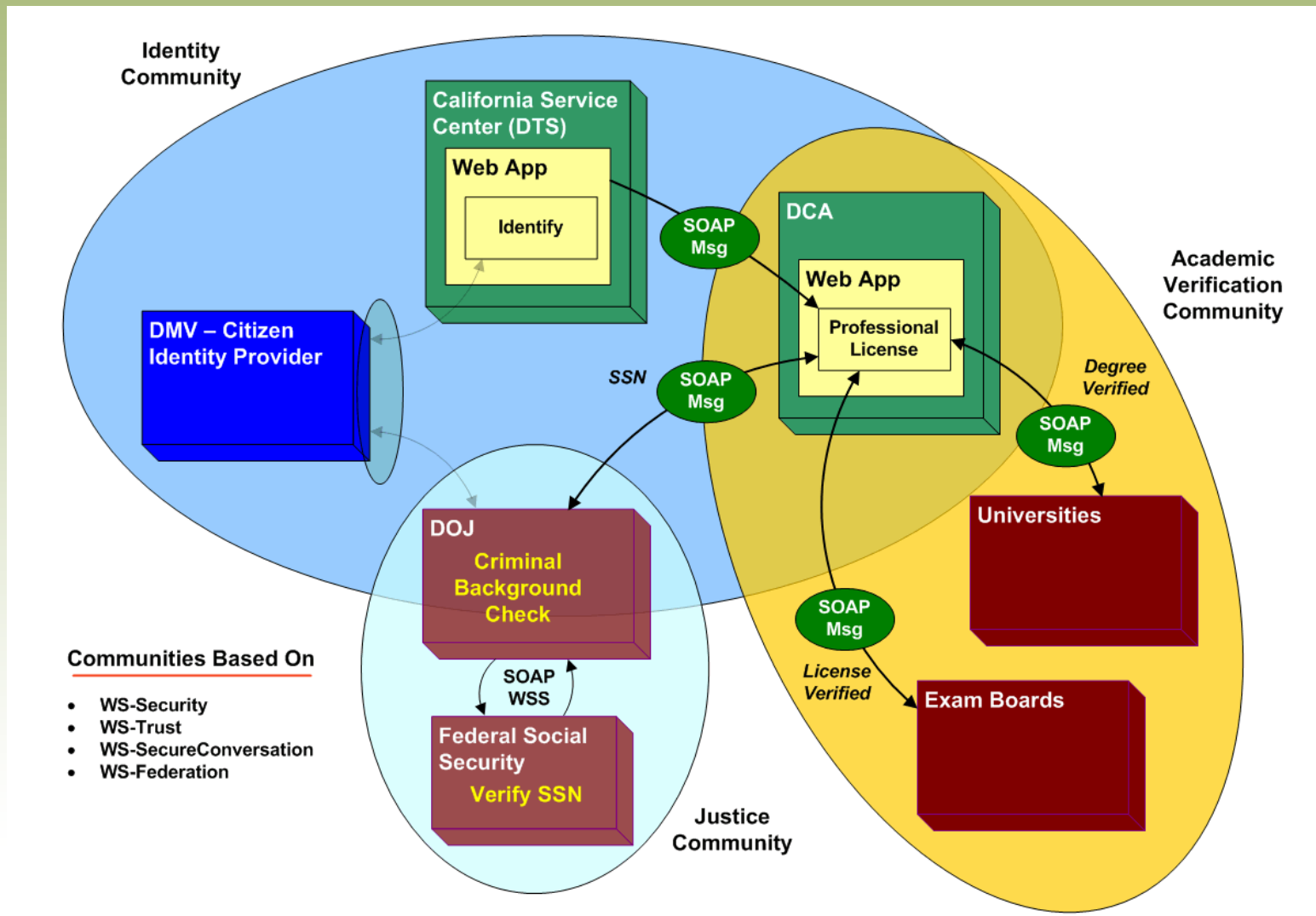
Security - Identification



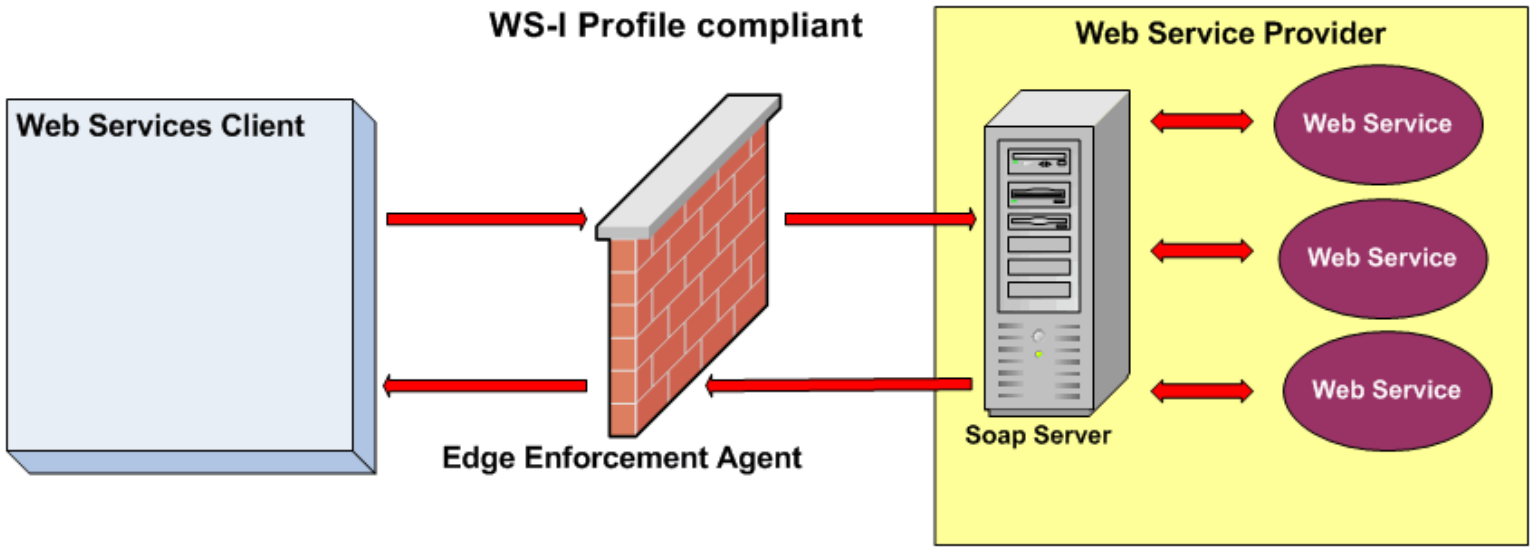
Security – Citizen Service



Security – Circle of Trusts



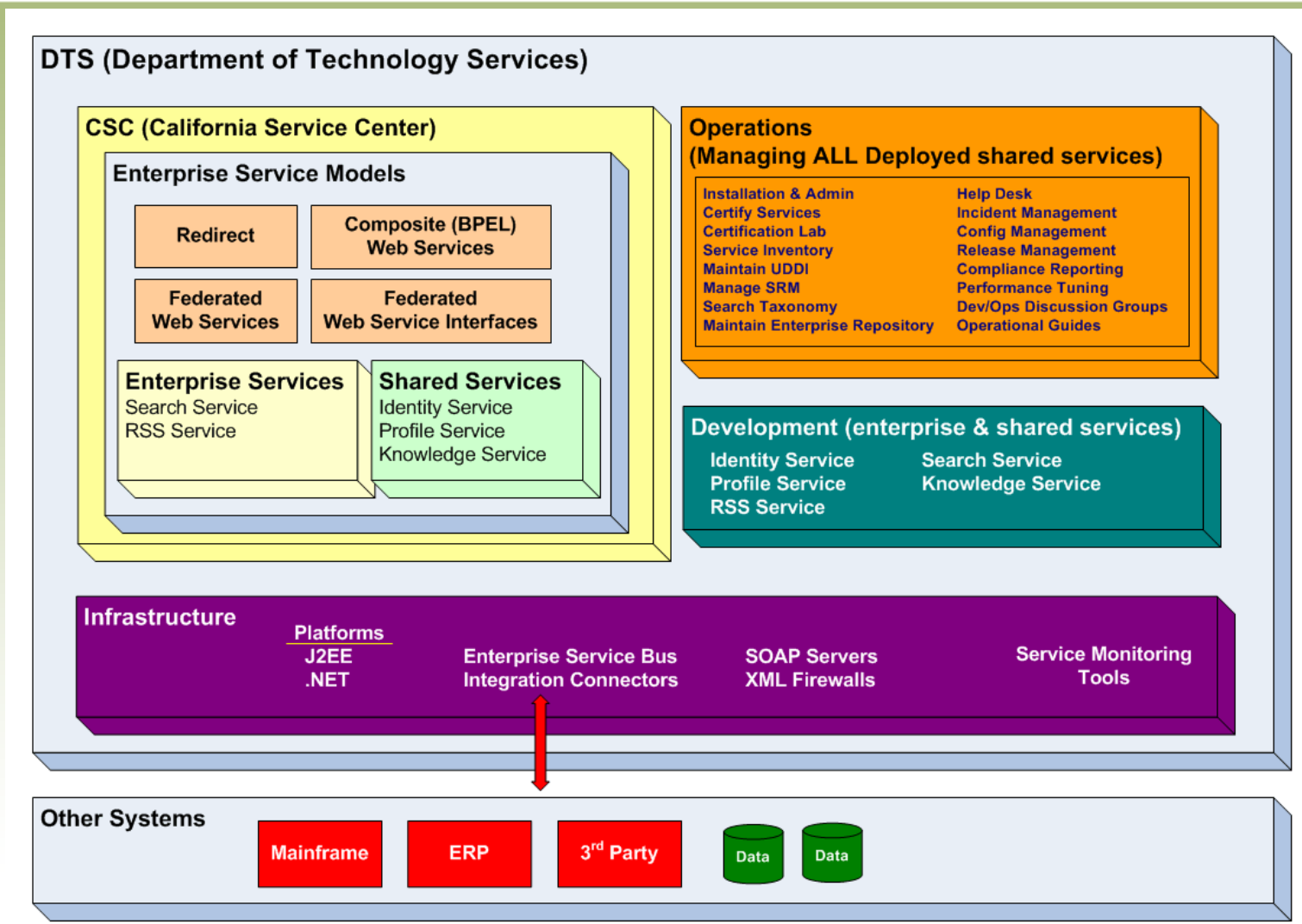
Security – XML Firewalls



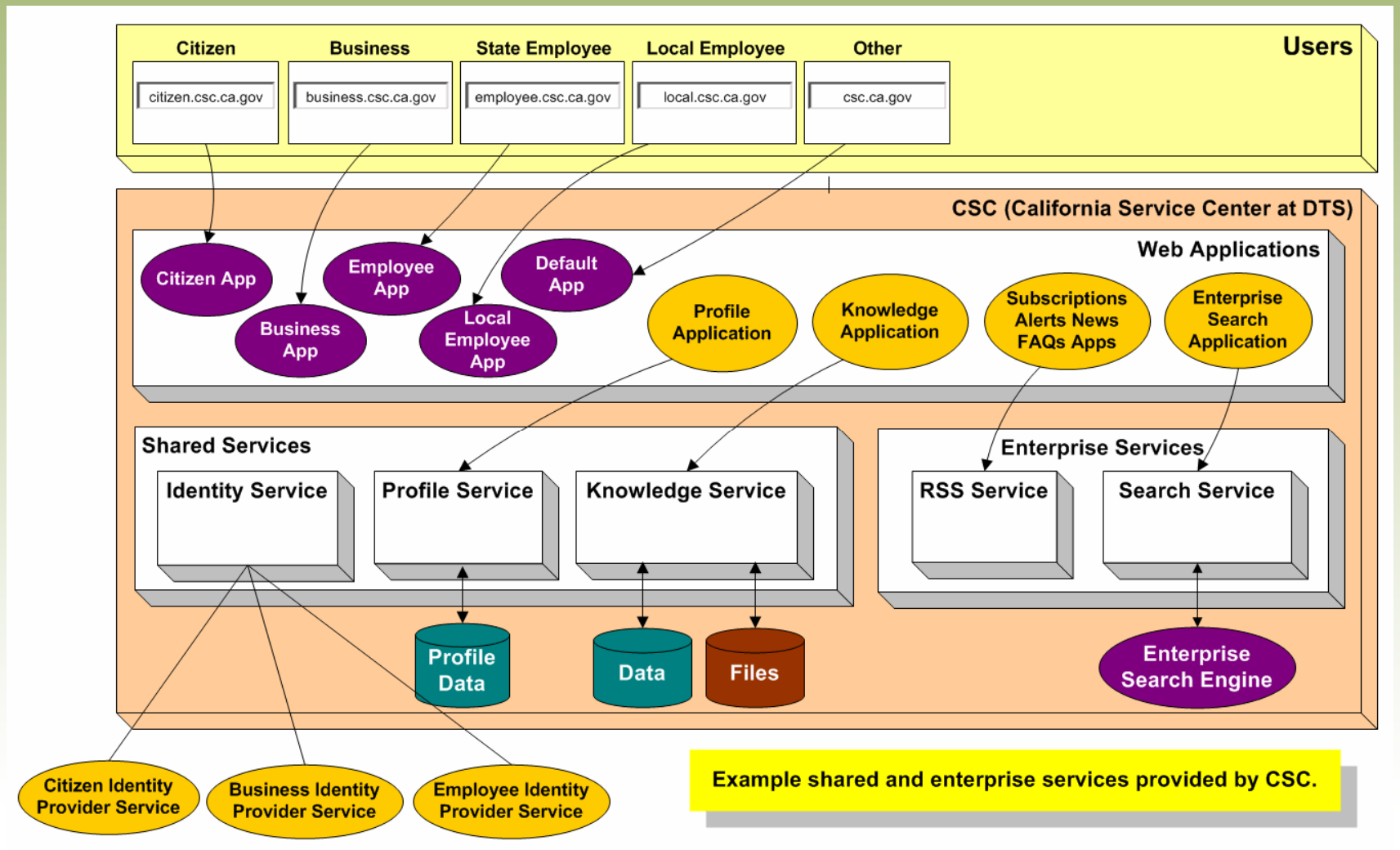
The Edge agent must look inside the SOAP/WSS messages and enforce security access to the SOAP server.

California Service Center at DTS

CSC Overview



CSC Enterprise Services



Questions